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Tremella rhizocarpicola sp. nov. and other interesting lichenicolous Tremellales and Filobasidiales in the Nordic countries

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Abstract

New data on the diversity and geographical distribution of lichenicolous Tremellales and Filobasidiales in the Nordic countries is presented. One new species, *Tremella rhizocarpicola*, is formally described. *Tremella pertusariae* and *T. protoparmeliae* are reported as new to the Nordic countries, *Syzygospora physciacearum* is new to Iceland, *Tremella rinodinae* is new to Sweden, and *T. caloplacae* is new to Norway. Nine species are reported as new to a number of Swedish provinces, including *Biatoropsis usnearum*, *Syzygospora bachmannii*, *S. physciacearum*, *Tremella caloplacae*, *T. cetrariicola*, *T. cladoniae*, *T. coppinsii*, *T. diploschistina*, and *T. hypogymniae*.

Key words

Basidiomycota, *Biatoropsis*, new species, new records, Scandinavia, *Syzygospora*

Introduction

Fungal mycoparasites, including lichen-parasites, are common among the Tremellomycetes (Basidiomycota, Fungi). Lichen-inhabiting species belong to the genera *Biatoropsis*,

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Tremella (both Tremellales) and *Syzygospora* (Filobasidiales). There are currently 50 lichenicolous species described in the group (Diederich 1986, 1996, 2003, Sérusiaux et al. 2003, Diederich 2007, Zamora et al. 2011, Millanes et al. 2012), and an additional five are known but have not yet been formally named (Diederich 1996, 2007). The actual diversity and distribution of lichen-inhabiting species is still largely unknown, as comparatively few mycologists and lichenologists collect lichenicolous fungi. Some tremellalean species are relatively easy to spot in the field as they induce the formation of conspicuous galls on the hosts, whereas others grow only inside the host hymenium producing few or no external symptoms. In these cases, study of host herbarium material is extremely useful for diversity surveys, and also improves our knowledge on the geographical distribution of taxa that are otherwise much overlooked in the field. In the Nordic countries, 15 tremellalean lichenicolous species have been reported so far (Nordin et al. 2014). During fieldwork in Sweden and Norway, and herbarium surveys undertaken in BG, S, and UPS, during 2012–2014, we found material allowing one new species to be formally described and several species to be newly reported to the Nordic countries, Iceland, Norway or Sweden.

Methods

Macromorphological traits were observed using a Zeiss Stemi 2000-C dissecting microscope. Microscopic structures were studied using handmade sections stained with Phloxin (1% in water) after pre-treatment with KOH (5%), following the methods of Diederich (1996), and observed with a Zeiss Axioscope-2 microscope. Macro- and microscopic photographs were taken with a Nikon Coolpix 995 camera fitted to both microscopes. The apiculus is not included in basidiospore measurements. Sizes in parentheses represent minimum and maximum observed values.

Results

Tremella rhizocarpicola **Diederich, Millanes & Wedin, sp. nov.**
MycoBank No: MB809897

Description. Basidiomata inside the hymenium of the host, resulting in blackish swellings of the host apothecia; context hyphae difficult to observe, 2.5–3.5 mm thick, thin walled, with clamp connections; haustorial branches not observed. Hymenium hyaline, containing numerous probasidia, intermixed with the hymenium of the host; probasidial initials clavate, proliferations occurring through the basal clamp; hyphidia and cystidia absent. Basidia, when mature, narrowly ellipsoid to subcylindrical, with one transverse septum (never oblique or longitudinal), slightly constricted at the septum, the lower cell elongate, with an attenuated stalk-like base, (14–)17–44 × 7–12(–13) mm (incl. stalk); epibasidia 3–3.5 mm thick, up to 65 mm long. Basidiospores

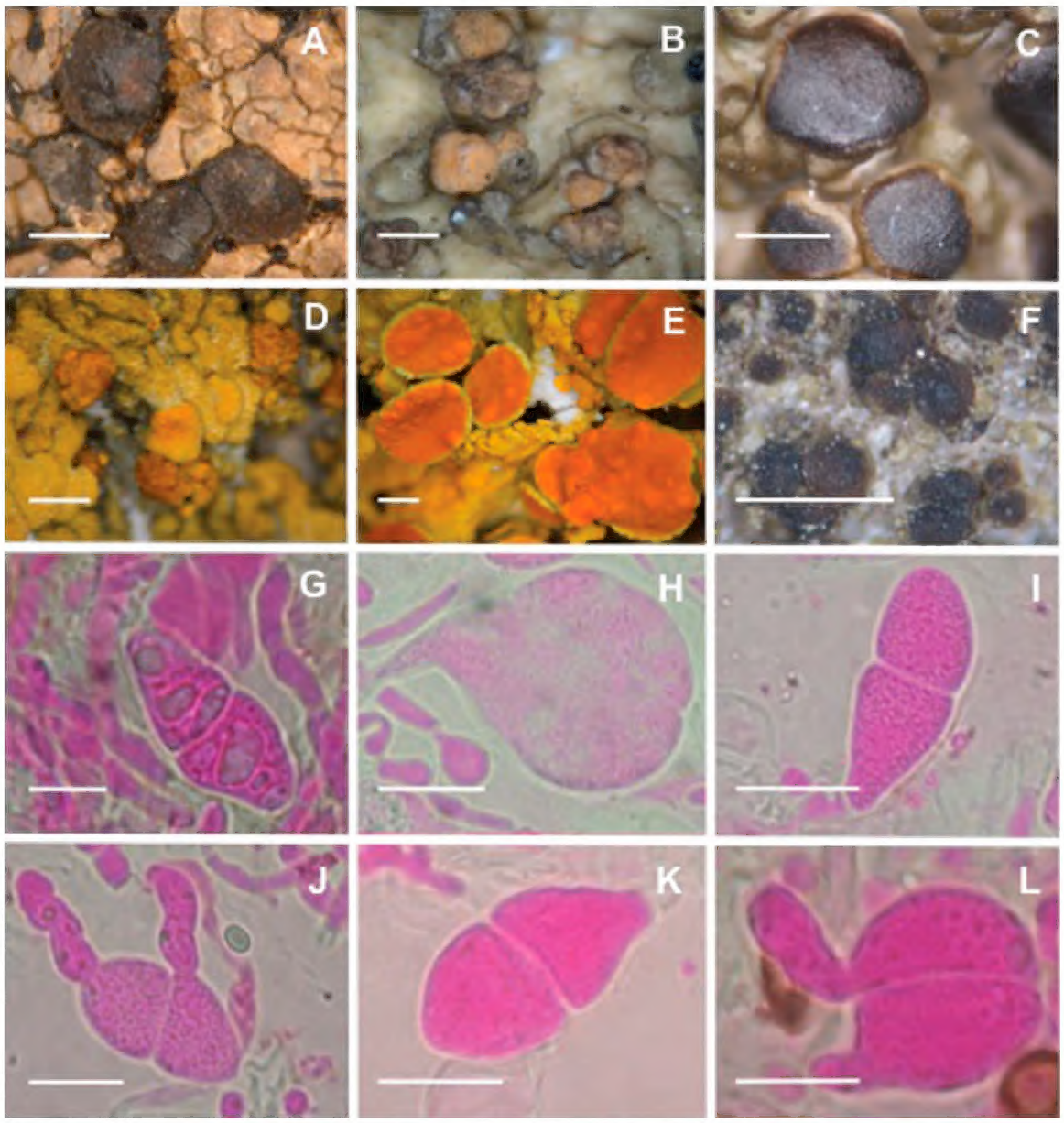

Figure 1. Photographs of new species or records for the Nordic countries, Norway, and Sweden. Macroscopic habit of *Tremella rhizocarpicola* on *Rhizocarpon lavatum* (holotype, BG: L-68612) (**A**), *T. pertusariae* on *Pertusaria hymenea* (S: F-131626) (**B**), *T. protoparmeliae*, asymptomatic on *Protoparmelia badia* (S: F-255342) (**C**), *T. caloplacae* on *Caloplaca decipiens* (S: F-253110) (**D**), *T. caloplacae* on *Xanthoria parietina* (S: F-253109) (**E**), and *T. rinodinae* on *Rinodina gennarii* (S: F-255341) (**F**). Basidium morphology in *Tremella rhizocarpicola* (**G**), *T. pertusariae* (**H**), *T. protoparmeliae* (**I**), *T. caloplacae* (S: F-255314) (**J**), and *T. rinodinae* (**K–L**). Scale bars: 1 mm (**A–F**) and 10 mm (**G–L**).

subglobose, with a large apiculus, 7.5–9.5 × 6–8.5 mm. Anamorph: conidial chains sometimes present in the hymenium. Individual conidia 3–5 × 3–5 mm.

Type. NORWAY, Rogaland, Suldal, on the N side of lake Stranddalsvatnet. On N facing phylitic rock, 59°26.26'N, 6°43.48'E, ca. 1000 m, 18 Aug 1999, P.G. Ihlen 957 (BG: L-68612).

Distribution, ecology and host. The new species is known from one locality in Denmark, two localities in Norway, and nine in Sweden, all growing inside the hymenium of *Rhizocarpon lavatum* on siliceous rocks, often along shorelines or near water.

Discussion. The species was tentatively described by Diederich (1996: 170) as *Tremella* sp. 3. The single specimen known at that time was very small, but the discovery of 12 additional collections from Denmark, Sweden and Norway (Fig. 1A) is now

enough for a formal description. There is little to add to the description and illustrations given by Diederich (1996), however. The only novelties are the wider range of basidium width and length (Fig. 1G) and the presence, occasionally, of an anamorph consisting of catenulate conidia. A sequence of the ITS barcode region is not provided, since recently collected specimens were too reduced for DNA extraction, and old specimens could not be amplified by PCR. Diederich (1996) indicated that this species was microscopically very similar to *Tremella protoparmeliae*, but *T. rhizocarpicola* could be distinguished by the formation of dark brown swellings on the host apothecia and by small differences in the size of the basidia. The additional specimens studied here show that there is an anamorph formed by catenulate conidia in *T. rhizocarpicola*, and the basidia of this species can be comparatively shorter and wider than those of *T. protoparmeliae*.

Additional specimens examined (all on *Rhizocarpon lavatum*): DENMARK. Faroe Islands: Nordoya, Bordö, Klaksvig, N end of Bordö Vig, rivulet Gravarå, 4 Sept 1956, G. Degelius (UPS: L-662460). – NORWAY. Oslo: Ekeberg, 13 May 1886, N.G. Moe (BG: L-58000). Rogaland: Suldal, on the north side of lake Stranddalsvatnet, 59°26.26'N, 6°43.48'E, ca. 1000 m, 18 Aug 1999, P.G. Ihlen 957 (BG: L-68612). – SWEDEN. Bohuslän: Foss, 1851, M.M. Floderus (UPS: L-662426). Bohuslän: Solberga, Rörtången, 10 June 1928, A.H. Magnusson 11329 (UPS: L-662425). Bohuslän: Ödsmål, Korsgården, 1 Aug 1931, A.H. Magnusson 12851b (UPS: L-662448). Bohuslän: Spekeröd, Groland, 28 Aug 1955, A.H. Magnusson 24616b (UPS: L-662457). Halland: Övraby, Sperlingsholm, 3 July 1851, T.M. Fries (UPS: L-132524). Halland: Tölö, Skårby, Valåsberget, 24 May 1925, A.H. Magnusson 9384b (UPS: L-662453). Halland, Karup par., SE of Båstad, on boulder in the river Kägleån, 10 Oct 1970, M. S. Christiansen 6498 (C). Härjedalen: Tännäs, Tännfallet waterfall in Tännån, 11 km NW of Tännäs, 62°29.04'N, 12°29.19'E, 6 July 2012, J. Hermansson 18827 (UPS: L-597926). Småland: Malmbäck, Älgaryd, 1875, P.G.E. Theorin (UPS: L-131500). Uppland: Danmark par., Linnés Hammarby, 2.4-2.5 km SE of Danmark church, the hill NE of the houses, 59°49.02'N, 17°46.59 E, 25 m. 15 Sept 2007, G. Thor 22045 (UPS: L-167626).

New records to the Nordic countries

Tremella pertusariae Diederich

Note. This species was previously recorded in Europe (Belgium, France, Germany, Great Britain, Ireland, Italy, and Spain), where it is very common in the western Pyrenees, and in America (Mexico and U.S.A) (Diederich 1996). Knutsson and Johansson (2011) reported it from Sweden, but with some hesitation since the material could not be identified microscopically. The five additional specimens reported here confirm the presence of the species in the Nordic countries. The fungus forms pale to dark brown or blackish galls, generally on the apothecia of *Pertusaria hymenea* (Fig. 1B), but also on the thallus of both *P. hymenea* and *P. pertusa*, and bears characteristic stalked basidia (Fig. 1H).

Specimens examined (all on *P. hymenea*). DENMARK. Jylland: Fredrikkshavn, W of Pikkerbakken, 20 June 1947, A.H. Magnusson 20958b (UPS: F-661189). – SWEDEN. Småland: Femsjö par., Femsjö, 1859, T.M. Fries (UPS: F-661180). Småland: Växjö par., Växjö, Jan 1880, E. Köhler (UPS: L-661177). Skåne: Oppmanna par., Bokenäset, July 1916, E.P. Vrang (S: F-131626). Skåne: Oppmanna par., Bokenäset, 19 July 1943, G. Degelius (UPS: L-661197). Öland: Ås par., Södra Ottenby lund, "Skogsudden", on ancient *Quercus robur*, in oak-dominated deciduous forest. 56°12.98'N 16°24.80'E 16 Feb 1999, T. Knutsson 99-092 (private herb.)

Tremella protoparmeliae Diederich & Coppins

Note. This species was previously only recorded in England (Diederich 1996). The fungus grows intrahymenially on *Protoparmelia badia*, without producing any external symptoms, which suggests that this species could in reality be common, but much overlooked as it is not visible macroscopically (Figs. 1C and 1I).

Specimens examined (all in the hymenium of *Protoparmelia badia*). SWEDEN. Torne Lappmark: Jukkasjärvi par., Ábeskosuolo, south-eastern part to the island, facing the shore of the lake, 68°21.88'N, 18°50.17'E, 29 July 2013, A. Millanes 915 & M. Méndez (S: F-255342). Uppland: Djurö par., Runmarö, Small hill at the NW end of the Lake Vitträsket, 59°16.44'N, 18°45.91'E, 27 Aug 2011, A. Millanes, S. Klopfstein & M. Westberg (S: F-255343).

New records to Iceland, Norway or Sweden

Syzygospora physciacearum Diederich

Note. New to Iceland and to the Swedish provinces Öland, Södermanland, and Västergötland.

This species is widely distributed, with numerous records in Africa, America, Asia, and Europe (Diederich 1996, van den Boom and Alstrup 1996, van den Boom et al. 1998, Motiejūnaitė 1999, van den Boom and Giralt 1999, Halonen et al. 2000, Kukwa et al. 2002, Himelbrant et al. 2013, Urbanachivene et al. 2013). In the Nordic countries it has been recorded in Finland, Norway, Sweden and Denmark (Diederich 1996, Puolasmaa et al. 2008, Hemberg 2014).

Specimens examined. ICELAND. W of Reyðarfjörður, lake Lagarfljót, SW of Hallormsstaður, Atlavík cove, W of Atlavík camping, siliceous rock outcrops in native *Betula* forest, on *Physcia tenella* subsp. *marina*, 4 Aug 2013, P. Diederich 17521 (private herb.). SWEDEN. Södermanland: Tyresö par., before the entrance of Tyresta National Park, on dead *Populus*, on *Physcia adscendens*, 56°10.26'N, 18°14.2'E, 3 m, 5 Apr 2014, A. Millanes 1028, S. Fernández-Brime & M. Westberg (S: F-255317).

Västergötland: Österplana par., Mt. Kinnekulle, Österplana hed, E of Nyängarna, 58°33.83 N, 13°24.5'E, 140 m, on *Fraxinus*, on *Physcia tenella*, 4 May 2009, M. Wedin 8392 (S: F-255318). Öland: Smedby par., Nedra Västerstad, garden in the N. part of the village., on old *Syringa* sp., on *Physcia tenella,* 56°25'27 N, 16°24'47 E, 29 Jan 2011, T. Knutsson 2011-002 (private herb.).

Tremella caloplacae (Zahlbr.) Diederich

Note. New to Norway and to the Swedish province Torne Lappmark.

The species was at first tentatively described as *Tremella* sp. 1 by Diederich (1996) and eventually formally described by Sérusiaux et al. (2003). It has been reported from Austria, Canada, France, Great Britain, Greece, Greenland, and Spain (Diederich 1996, 2007, Sérusiaux et al. 2003), growing inside the hymenia, or exceptionally on the thallus, of different *Caloplaca* species, viz. *C. arenaria*, *C. arnoldii*, *C. aurantia*, *C. carphinea* and *C. saxicola* (Diederich 1996, Sérusiaux et al. 2003), and on the thallus of *Xanthoria sorediata* (Diederich 2007). It was recently reported as new to the Nordic countries (Thell et al. 2014) from two Swedish collections, growing on new hosts: *Caloplaca decipiens* (on the thallus; Fig. 1D) and *Xanthoria parietina* (inside the hymenium; Fig. 1E). Here it is reported on a new host (*Xanthoria elegans*), in Sweden. All samples below are on *X. elegans*, growing inside the hymenium or on the thallus. All specimens bear two-celled basidia (Fig. 1J) and are very similar microscopically. Further investigations are needed, however, to check if all specimens growing on Teloschistaceae belong to a single species.

Specimens examined (all on *Xanthoria elegans*): NORWAY. Oppland: Lom municipality, Runningsgrende, Kleive, 61°42.95'N, 8°14.05'E, 720–850 m, 29 June 2013, A. Millanes 808 (S: F-255312). – SWEDEN. Torne Lappmark: Jukkasjärvi par., Paddos, 68°19.16'N, 18°51.93'E, 625 m, 28 Aug 2013, A. Millanes 904 & M. Méndez (S: F-255313). Torne Lappmark: Jukkasjärvi par., Paddos, 68°19.13'N, 18°51.89'E, 596 m, 28 Aug 2013, A. Millanes 908 & M. Méndez (S: F-255314).

Tremella rinodinae Diederich & M. S. Christ.

Note. New to Sweden.

This fungus was previously known only from Denmark (Diederich 1996). It grows in the hymenium of *Rinodina gennarii*, forming distinct brown swellings on the host apothecia (Fig. 1F). The basidia have one transverse (Fig. 1K), or exceptionally longitudinal (Fig. 1L), septum.

Specimens examined (all in the hymenium of *Rinodina gennarii*): SWEDEN. Bohuslän: Skaftö par., Östersida, 3 Aug 1928, G. Degelius (UPS: L-87926). Skåne: Oppmanna par., Arkelstrop, July 1916, E.P. Vrang (S: F-255341).

Records new to some provinces in Sweden

Biatoropsis usnearum Räsänen

Note. New to Bohuslän.

This species has a wide distribution and has been recorded in all Nordic countries except Iceland (i.e., Denmark, Finland, Norway, and Sweden) (Diederich and Christiansen 1994, Nordin et al. 2014).

New specimen examined. SWEDEN. Bohuslän, Kville/Tanum pars., following Torsbo stream, low part of the cliff, mixed forest with *Alnus*, *Betula*, *Corylus*, *Picea* and *Salix*, on *Usnea* sp., 58°47.55'N, 11°8,4'E, 14 Apr 2013, A. Millanes 695 (S: F-255315).

Syzygospora bachmannii Diederich & M.S. Christ.

Note. New to Gotland and Medelpad.

This material had been placed in S long ago, but as the specimens have apparently not been published or otherwise recorded elsewhere, we report them here. The species had been previously recorded in the Nordic countries, particularly in Sweden and Finland (Diederich 1996).

New specimens examined. SWEDEN. Gotland: Sundre par., ca 1 km SE of Sundre church, along small track 500 m S Muskmyr, open limestone pavement ('alvar'), on the ground, on *Cladonia macroceras*, 56°55'N, 18°12'E, M. Wedin 6802 (S: F-102481). Gotland: Klinte, on alvar ground, on *C. macroceras*, 7 May 1937, T.E. Hasselrot (S: F-255268). Medelpad: Selånger par., on rests of rotten plants on the surface of a small stone, next to the ground, in forest, on *C. cornuta*, 60 m, 25 Nov 1928, E. Eriksson (S: F-161742).

Tremella cetrariicola Diederich & Coppins

Note. New to Dalarna, Norrbotten, and Ångermanland.

In the Nordic countries this species has been recorded in Finland, Norway and Sweden (Diederich 1996, Pippola and Kotiranta 2008).

New specimens examined (all on *Tuckermanopsis chlorophylla*). SWEDEN. Dalarna: Mockfjärd par., ca. 1.2 km WNW Bastberget, 60°22.64'N, 14°55.73'E, 220 m, 28 Sept 2010, M. Westberg 10-116 (S: F-255319). Norrbotten: Norrfjärden par., Lustgården Nature Reserve, 65°32.76'N, 21°26.41'E, 25 Aug 2009, M. Wedin 8491 (S: F-255320). Norrbotten: Norrfjärden par., ca. 5.5 km NNW of Sjulsmark, along a forest road to the lake Hällträsket close to the beginning of the road Abborrtjärnvägen, 65°34.19'N, 21°27.35'E, 28 Aug 2009, M. Wedin 8566 (S: F-255333). Ångermanland: Örnsköldsvik, Västanåhöjden, at turnoff towards Västanåbodarna, old *Picea*-dominated forest, 63°10.42'N, 18°14.33'E, 21 July 2010, M. Wedin 8763 (S: F-255322).

Tremella cladoniae Diederich & M.S. Christ.

Note. New to Öland.

In the Nordic countries this species has been reported from Denmark, Finland, and Sweden (Diederich 1996, Pippola and Kotiranta 2008, Westberg and Thor 2014).

New specimen examined. SWEDEN. Öland: Böda par., Trollskogen, Norra Uddändan, between Hjerteskeppet and Grankullavik, on semi-dead *Juniperus*, on *Cladonia polydactyla* and *C. coniocraea*, 57°21.38'N, 17°6.91'E, 24 Jan 1998, T. Knutsson 98-013 (private herb.).

Tremella coppinsii Diederich & G. Marson

Note. New to Bohuslän, Dalsland, Dalarna and Västergötland.

The species has previously been recorded in the Scandinavian Peninsula, i.e., Norway and Sweden (Holien and Tønsberg 1994, Diederich 1996).

New specimens examined (all on *Platismatia glauca*). SWEDEN. Bohuslän: Kville/Tanum pars., following Torsbo stream, low part of a cliff, mixed forest with *Alnus*, *Betula*, *Corylus*, *Picea* and *Salix*, on *Alnus*, 58°47.55'N, 11°8.4'E, 14 Apr 2013, A. Millanes 694 (S: F-255266). Dalarna: Mockfjärd par., ca. 1.2 km WNW Bastberget, 60°22.73'N, 14°55.96'E, 240 m, 28 Sept 2010, M. Westberg 10-114 (S: F-255324). Dalsland: Dals-Ed par., Torstorp, 1.6 km NW Knä sjö, on *Sorbus aucuparia* at the edge of mixed forest 58°50.55'N, 12°5.9'E, 28 Nov 2013, T. Knutsson (private herb.). Västergötland: Trollhättan par., S of Lake Åkersjö, close to the lock, *Picea* dominated forest with *Quercus*, *Acer* and *Corylus*, on *Picea*, 58°28.74'N, 11°36.19'E, 15 Apr 2013, A. Millanes 710 (S: F-255325). Västergötland: Trollhättan par., Brandsbo Nature Reserve, mixed forest with *Alnus*, *Corylus*, *Quercus*, *Picea*, and *Salix*, along a stream (very humid area), 58°28.64'N, 11°35.33'E, 11 m, 15 Apr 2013, A. Millanes 725 (S: F-255326).

Tremella diploschistina Millanes, M. Westb., Wedin & Diederich

Note. New to Öland.

In the Nordic countries the species has been so far only reported from Sweden (Millanes et al. 2012).

New specimens examined (all on *Diploschistes muscorum*): SWEDEN. Öland: Stenåsa par., Stenåsa alvar, SSW of lake Möckelmossen, 56°40.28'N, 16°23.02'E, 27 Apr 2013, T. Knutsson 2013-018 (S: F-255327). Öland: Resmo par., Gynge alvar, ca. 2,0 km E of Resmo church, 56°32.52'N, 16°28.6'E, 6 May 2014, M. Westberg 14-001 (S: F-255349).

***Tremella hypogymniae* Diederich & M.S. Christ.**

Note. New to Bohuslän, Dalarna, Norrbotten, Pite Lappmark, and Torne Lappmark.

This is a widely distributed species. In the Nordic countries it has been reported from Denmark, Finland, Norway, and Sweden (Diederich 1996, Alstrup et al. 2004, 2008, Pippola and Kotiranta 2008).

New specimens examined (all on *Hypogymnia physodes*). SWEDEN. Bohuslän: Tanum par., Lammön, on the way to Lammön, mixed forest with *Pinus* and *Quercus*, on dead branch of *Quercus*, 58°59.63'N, 11°5.39'E, 13 Apr 2013, A. Millanes 664 (S: F-255328). Dalarna: Mockfjärd par., ca. 1.2 km WNW Bastberget, 60°22.72'N, 14°55.94'E, 28 Sept 2010, M. Westberg 10-115 (S: F-255348). Dalarna: Älvdalen par., Gummas Nature Reserve, 61°19.2'N, 13°31.7'E, 29 Sept 2010, M. Wedin 8778 (S: F-255329). Dalarna: Orsa par., Mt. Stora Tunturiberget, 61°22.66'N, 14°49.44'E, 30 Sept 2010, M. Wedin 8796 (S: F-255331). Dalarna: Rättvik par., N of the village Västberg, at the parking lot ca. 50 m S of the E end of Lake Ammtjärnen, on *Picea*, 60°94'N, 15°08'E, 21 Apr 2012, A. Millanes 610 (S: F-255330). Norrbotten: Norrfjärden par., ca. 5.5 km NNW of Sjulsmark, along a forest road to the lake Hällträsket close to the beginning of the road Abborrtjärnvägen, 65°34.19'N, 21°27.35'E, 28 Aug 2009, M. Wedin 8564 (S: F-255321). Pite Lappmark: Arvidsjaur par., ca. 19 km NE of Moskosel, NE slope of N Granberget, 65°57.76'N, 19°48.83'E, 27 Aug 2009, M. Wedin 8544 (S- F-255332). Torne Lappmark: Jukkasjärvi par., Kungsleden, way to Abiskojaure, after 'Tältlägret' on a dead trunk of *Betula*, 68°19.05'N, 18°44.25'E, 453m. 31 Aug 2013, A. Millanes 946 (S: F-255334).

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References

Alstrup V, Svane S, Sochting U (2004) Additions to the lichen flora of Denmark VI. Graphis Scripta 15: 45–50.

Alstrup V, Grube M, Motiejūnaitė J, Nordin A, Zhurbenko M (2008) Lichenicolous fungi from the Skibotn area, Troms, Norway. Graphis Scripta 20: 1–8.

Diederich P (1986) Lichenicolous fungi from the Grand Duchy of Luxembourg and surrounding areas. Lejeunia NS 119: 1–26.

Diederich P (1996) The lichenicolous heterobasidiomycetes. Bibliotheca Lichenologica 61: 1–198.

Diederich P (2003) New species and new records of American lichenicolous fungi. Herzogia 16: 41–90.

Diederich P (2007) New or interesting lichenicolous heterobasidiomycetes. Opuscula Philolichenum 4: 11–22.

Diederich P, Christiansen MS (1994) *Biatoropsis usnearum* Räsänen, and other heterobasidiomycetes on *Usnea*. Lichenologist 26: 47–66. doi: 10.1017/S002428299400006X

Halonen P, Kukwa M, Motiejūnaitė J, Lohmus P, Martin L (2000) Notes on lichens and lichenicolous fungi found during the XIV Symposium of Baltic Mycologists and Lichenologists in Järvselja, Estonia. Folia Cryptogamica Estonica 36: 17–21.

Hemberg J (2013) SLFs vårexkursion till Blekinge den 26–28 April 2013. Lavbulletinen 2013: 36–43.

Himelbrant DE, Motiejūnaitė J, Pykälä J, Schiefelbein U, Stepanchikova IS (2013) New records of lichens and allied fungi from the Leningrad region, Russia. IV. Folia Cryptogamica Estonica 50: 23–31. doi: 10.12697/fce.2013.50.04

Holien H, Tønsberg T (1994) The 10th meeting of the Nordic Lichen Society in Nord-Trondelag, Norway, 1993. Graphis Scripta 6: 67–75.

Knutsson T, Johansson T (2011) Lavfloran i Ottenbylund. Länsstyrelsen, Kalmar. Meddelandeserien 2011: 13.

Kukwa M, Motiejūnaitė J, Rutkowski P, Zalewska A (2002) New or interesting records of lichenicolous fungi from Poland I. Herzogia 15: 129–139.

Millanes AM, Westberg M, Wedin M, Diederich P (2012) *Tremella diploschistina* (*Tremellomycetes*, *Basidiomycota*, Fungi), a new lichenicolous species growing on *Diploschistes*. Lichenologist 44: 321–332. doi: 10.1017/S0024282911000788

Motiejūnaitė J (1999) Dzukijos nacionalinio parko kerpes ir su jomis susije grybai [Lichens and allied fungi of Dzukija National Park]. Botanica Lithuanica 5: 137–153.

Nordin A, Moberg R, Tønsberg T, Vitikainen O, Dalsätt Å, Myrdal M, Snitting D, Ekman S [date of consultation 2014-08-16]. Santesson's checklist of Fennoscandian lichen-forming and lichenicolous fungi. Museum of Evolution, Uppsala University [http://130.238.83.220/santesson/home.php]

Pippola E, Kotiranta H (2008) The genus *Tremella* (Basidiomycota, Tremellales) in Finland. Annales Botanici Fennici 45: 401–434. doi: 10.5735/085.045.0601

Puolasmaa A, Pippola E, Huhtinen S, Hyvärinen H, Stenroos S (2008) One lichen and eleven lichenicolous species new to Finland. Graphis Scripta 20: 35–43.

Sérusiaux E, Diederich P, Ertz D, van den Boom P (2003) New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. IX. Lejeunia N. S. 173: 1–48.

Thell A, Alstrup V, Arup U, Bendiksby M, Feuerer T, Haugan R, Kärnefelt I, Klepsland JT, Kukwa M, Launis A, Millanes AM, Motiejūnaitė J, Nordin A, Prieto M, Pykälä J, Seaward MRD, Timdal E, Tsurykau A, Vitikainen O, Westberg M (2014) New or interesting lichens and lichenicolous fungi from the Vadstena area, Östergötland, Sweden. Graphis Scripta 26: 15–33.

Urbanavichene I, Urbanavichus G, Mežaka A, Palice Z (2013) New records of lichens and lichenicolous fungi from the Southern Ural Mountains, Russia. II. Folia Cryptogamica Estonica 50: 73–80. doi: 10.12697/fce.2013.50.10

van den Boom PPG, Aproot A (1996) De lichenologische najaarsexcursie van 1995 naar Ameland (prov. Friesland). Buxbaumiella 39: 47–52.

van den Boom P, Sérusiaux E, Diederich P, Brand M, Aptroot A, Spier L (1998) A lichenological excursion in May 1997 near Han-sur-Lesse and Saint-Hubert, with notes on rare and critical taxa of the flora of Belgium and Luxembourg. Lejeunia 158: 1–58.

van den Boom PPG, Giralt M (1999) Contribution to the flora of Portugal, lichens and lichenicolous fungi II. Nova Hedwigia 68: 183–195.

Westberg M, Thor G (2014) Lavfloran på Stora Bornö - SLF:s höstexkursion 2013. Lavbulletinen 2014: 19–33.

Zamora JC, Pérez-Ortega S, Rico VJ (2011) *Tremella macrobasidiata* (Basidiomycota, Tremellales), a new lichenicolous fungus from the Iberian Peninsula. Lichenologist 43: 407–415. doi: 10.1017/S0024282911000405